

Percentage Yield.

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The theoretical yield of a chemical reaction is the yield calculated using stoichiometry.

The actual yield of a chemical reaction is the amount of product you get when the reaction is done in the laboratory. The actual yield of a reaction is always less than the theoretical yield.

The percentage yield is a calculation that is used to measure how close the actual yield is to the theoretical yield.

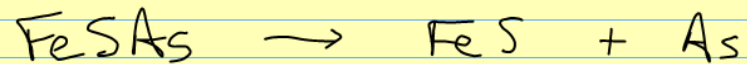
To calculate the percentage yield we use:

$$\% \text{ yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100\%$$

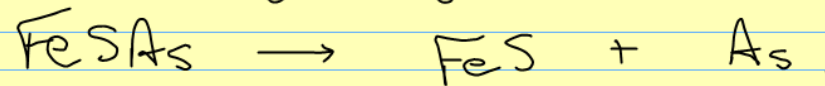
To calculate yield in a problem

- ① find the limiting reagent
- ② calculate the theoretical yield
- ③ use the theoretical and actual yield to find the percentage yield.

Example #1: Arsenic can be formed by decomposing the mineral FeSAs:



When 250 g of the mineral is heated 95.3 g of arsenic is produced. What is the percentage yield?



$$\begin{array}{c}
 \begin{array}{ccc}
 M = 162.83 \text{ g/mol} & 250 \text{ g} & m_{\text{As}} \text{ (theoretical yield)} \\
 \downarrow & \downarrow & \uparrow \\
 n_{\text{FeSAs}} & \xrightarrow{\frac{1 \text{ mol FeSAs}}{1 \text{ mol As}}} & n_{\text{As}} \\
 & & \uparrow \\
 & & M_{\text{As}} = 74.92 \text{ g/mol}
 \end{array}
 \end{array}$$

$$n_{\text{FeSAs}} = 250 \text{ g} \times \frac{1 \text{ mol}}{162.83 \text{ g}} = 1.535 \text{ mol FeSAs.}$$

$$n_{\text{As}} = 1.535 \text{ mol FeSAs} \times \frac{1 \text{ mol As}}{1 \text{ mol FeSAs}} = 1.535 \text{ mol As}$$

$$m_{\text{As}} = 1.535 \text{ mol As} \times \frac{74.92 \text{ g}}{\text{mol}} = 115.0 \text{ g}$$

$$\% \text{ yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100\%.$$

$$= \frac{95.3 \text{ g}}{115.0 \text{ g}} \times 100\%$$

$$= 82.9 \%$$

\therefore the percentage yield is 82.9%.